

## Periscope.

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### *α.*—PHYSIOLOGY OF THE NERVOUS SYSTEM.

Luchsinger recently has taken up an investigation of the phenomena of the venous hearts in the wing of the bat. A series of experiments in the last year has shown that certain chemical, mechanical, and electrical irritations generate a rhythm in the resting heart. Experiments upon the ureter have demonstrated that mechanical distension is a powerful cause of rhythm, the distension being a purely peripheral irritant of it. The wing of the bat presents an excellent but little used object for researches. To spread it out he used Emmert's holder for the frog web. The vein in the field of the microscope was slightly magnified by a low power. In the first series of experiments the brachial plexus was prepared and divided. The veins of the wing continued to pulsate strongly, eight to ten times per minute. That no fine nervous filaments might be in connection with the venous hearts, the ulnar, median, and radial nerves were exposed and divided, but the venous pulse still continued. Then the blood-vessels running to and from the wing were held aside, and all the remaining connection between the wing and body severed by a strong scissors; but the rhythm of the veins still continued. Now only fine sympathetic nerve fibres can remain on the walls of the blood-vessel in connection with the central nervous system. To destroy these he brushed the wall of the blood-vessel with ammonia, but the pulsation still continued. From these facts Luchsinger infers that the pulsation of the veins is due to peripheral causes. In the second series of experiments he amputated the wing, but the pulsation, after the first minute succeeding the amputation, continued. In the third series of experiments he ligated the wing and amputated it above the liga-

ture, but the pulsation continued ten to fifteen minutes. In the fourth series of experiments the animal was asphyxiated, a canula bound in the aorta, and ten minutes after death well-beaten blood of an ox run through the blood-vessels, from a height of forty to fifty centimetres. The blood was used at the temperature of the room, and the circulation was easily set up, the veins becoming swollen. Pulsation then took place and continued twenty-four hours after death in a marked manner. This experiment of artificial transfusion showed more. If the pressure was at zero, after a few minutes the pulsation was arrested, the transfused liquid flowing from the vein in small quantity. If, however, the pressure was elevated forty to fifty centimetres (water), then the veins were swollen and the rhythmic play began. If the pressure sank to zero, then the pulse-beat sank to zero, but not suddenly. He infers that, as in the case of the heart and ureter so in the blood-vessel, the mechanical distension of the contractile wall is a powerful irritation to call out rhythm. The seat of the peripheral irritation, whether in the ganglia or in the muscle fibre, is not to be definitely decided from these experiments. Whilst the rhythm is independent of the central nervous system, it is not to be inferred that the central nervous system is without any regulating influence upon the rhythm. When the ulnar nerve was irritated there was a marked increase of pulsation, never any slowing. Warming the wing increased the pulsation, whilst higher temperature caused diastolic arrest; but upon cooling, the pulsation again appeared. Tetanizing electrical currents caused considerable acceleration of the rhythm. Nitrate of amyl caused in the beginning a great acceleration and increase of pulsation, but shortly before the death an arrest of the movement.—*Pflüger's Archiv*, Band xxvi, Heft 9 and 10.

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Szpilman and Luchsinger have been experimenting upon atropin and smooth muscular fibre. That atropin dilates the pupil and paralyzes intestinal movements is due, according to Von Bezold, to an action mainly on the local ganglia. Smooth muscular fibres were not soon affected by the drug. In contradiction to this view there are other experiences. In the beginning of this century Kieser found that atropin did not dilate the pupil of birds, and L. and Gysi have found the same to be true for the turtle. The iris of birds and reptiles is striated, whilst atropin acts on the smooth muscular fibres of the mammalia and amphibia.

They try to explain this by an action of atropin on smooth muscular fibre, and not on the ganglia as heretofore held.

The œsophagi of different vertebrates seemed a suitable object for experiment. The œsophagus of a frog and the crop of a bird have smooth muscular fibres ; the œsophagus of the dog and rabbit is striated; whilst the œsophagus of the cat has striped fibres in the upper three fourths of its length, and in the lower fourth exclusively smooth muscular fibres. In the œsophagus is also found a large number of ganglion cells. In the first experiment in a rabbit the vagi were prepared, divided, a canula bound in the jugular, tracheotomy performed, and the cervical segment of the œsophagus laid bare. Atropin, .08 grm., was injected in divided doses. Vagi were tested up to the death of the animal, and called out strong contraction of the œsophagus. In the second experiment a pigeon had the vagi prepared, a canula bound in the jugular, and the lower part of the crop laid bare. It reacted well upon irritation of the vagi. A cubic centimetre of a 1-per-cent. sol. of atropin was given every five minutes, the vagus was tested, and in the interval the crop was surrounded by warm moist cloths. After a dose of .03 cubic centimetre of the atropin solution, the effect of irritation of the vagus was extremely small, and after .05 c. c. the strongest irritation of the vagus was without effect. Artificial respiration was instituted and the thoracic portion of the œsophagus laid bare, but irritation of the vagus was without effect, whilst direct irritation called out weak contraction. The heart beat well and the nerves going to the muscles were irritable. In a third experiment a large cat was narcotized by an injection of .03 grain of muriate of morphia through the jugular. Tracheotomy was performed, the two vagi prepared and divided. Artificial respiration was kept up, and the œsophagus drawn out by means of a resection of the lower ribs on the left side ; the attached vagus was isolated and the lower fourth of the œsophagus in the neighborhood of exclusively smooth muscles divided. Irritation of the vagi called out contraction of the upper as well as the lower part.

Then .05 gr. of atropin in solution was injected through the jugular, and in about five minutes irritation of the vagus was repeated. The upper part of the œsophagus contracted strongly ; the lower part had lost nearly all irritability. Then 2 c. c. of atropin solution were injected. Again the vagus was irritated, but the strongest irritation of the vagus had no effect. Direct irritation called out a weak contraction, and the upper segment

acted strongly upon every irritation. When the animal died, the inferior mesenteric ganglion was sought out, and the nerves going to the bladder prepared; the irritation called out weak contraction of the bladder. In the fourth experiment .03 c. c. of solution of atropin was injected subcutaneously in a frog. After complete paralysis the vagi were prepared and divided. Irritation of the vagi with electric current caused a contraction. In another frog .05 gr. of atropin was injected, and the irritation of the vagus called out an extremely weak contraction. The irritation of the nerves going to the muscles caused marked contraction.

From these experiments they infer that the smooth muscular fibres of the crop and œsophagus of the bird were paralyzed by atropin, whilst the striped fibres of the œsophagus in the rabbit were not affected by the largest doses. In the cat the smooth muscular fibres of the lower fourth of the œsophagus were paralyzed by atropin, whilst the upper striped segment retained its irritability under large doses. Less marked is the action in the case of a frog, as large doses are needed; as is the case to paralyze the sphincter iridis of this animal. That the paralysis of the œsophagus is not due to the action on the ganglia is proven by the fact that the œsophagus in all vertebrates should be affected. That atropin does not affect striated muscles is in accordance with its action on the striped muscles of the iris of birds and reptiles. Hence, it is inferred that atropin is a specific poison to smooth-muscle cells or the nerve-endings in them.—*Pflüger's Archiv*, 1881.

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Brown-Séquard exhibited to the Biological Society a monkey in whom, four months previously, he had extirpated the motor centre of the left posterior extremity. There ensued a paralysis of the left posterior member, then atrophy and contracture in a state of flexion. The limb had diminished in length three centimetres. He stretched the left sciatic by means of a kilogramme weight for five minutes. The paralysis increased immediately afterward, but the contracture diminished, and in an hour afterward the member increased in length a centimetre, and in five days the two limbs were equal in length, the contraction had totally disappeared, and the paralysis was very much improved. At the time the left limb was not over a centimetre shorter. He stated that the contracture was due to a particular state of the

motor nerve-endings in the muscle, that the cause of the contraction resided neither in the brain nor in the spinal cord, for the cerebral changes persist, but the contracture is able to disappear.—*Le Progrès Médical*, November 26, 1881.

Morat has studied the physiological action of different substances upon the movements of the stomach and intestines. He experimented with pilocarpin and atropin. The experiments were made upon dogs feebly curarized. The pilocarpin was injected into a vein, or into the subcutaneous cellular tissue, in the dose of .01 to .02 gr., which caused at the end of some minutes the appearance of extremely energetic rhythmic movements of the stomach and small intestines. These movements are similar to the normal movements of the two organs, but differ from them especially in their energy and extent. If at this moment one injects into a vein .01 gr. of neutral sulphate of atropin the movements are in less than a minute completely arrested. These experiments demonstrate that pilocarpin and atropin have an action on the stomach and intestines,—an action similar to that upon the glands.—*Le Progrès Médical*, Nov. 12, 1881.

Buccola (*Bibliographia-Archivio Italiano per le Malattie Nervose*, Septembre–Novembre, 1881) has studied the time involved in a simple psychical act and the physiological “time of reaction” in the insane. The time in which an irritation is made of an organ of sense and the person experimented on is able to signal with his hand, is called the “time of reaction.” He used the chromoscope of Kipp, which can be used to estimate the thousandth part of a second. The following parts of a second, express the “time of reaction” as given by Buccola :

	Eye.	Ear.	Touch.
1st observation	.168	.115	.141
2d “	.151	.119	.129
3d “	.172	.131	.152

If we examine these numbers it will be found that the time by the ear is less than by either the electrical irritation or a luminous object. He thinks that this retardation varies according to the organ of sense excited, depending most probably upon the different physiological intensity of the various sensory stimuli. The psychical constitution of the individual has an effect on the

"time of reaction"; in the uncultivated the time is longer than in the educated. The more lively the attention, the shorter the duration of the "time of reaction." Thus, in the imbecile and idiot, where there is great wandering of attention, the time of reaction is quite long. From his experiments upon the insane he arrives at the following conclusions in regard to their time of reaction. The retardation of the mean time of reaction is so much more, the more the patient presents the character of greater weakness of mind. By the stimulus of sound the lowest time of reaction was .159, which ascended finally to .566. Between the maximum and minimum time of reaction there is a great numerical difference, and the difference increases in a measure as every stage of simple weakness of mind is joined by intermediate steps to profound dementia. The minimum time of reaction is much greater than that of a healthy man. The time of reaction demonstrates objectively in the clearest manner how much resemblance exists between imbecility and idiocy on the one side and the different degrees of dementia on the other.

It makes more simple psychical life, for the perception of an external phenomenon passes away with identical characteristics into the extreme type of the pathology of the human mind.

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Kronecker and Meltzer have arrived at the following results in regard to the act of deglutition. In normal swallowing the mass is injected through the œsophagus into the stomach before peristalsis can be of value.

1. Every act of swallowing excites not only the corresponding contraction of the œsophagus, but inhibits at the same time the previously called-out but not yet manifest contraction of a previous act of deglutition.
2. The second motor irritation is active when the first ensuing movement is over.
3. When the whole glosso-pharyngeal nerve is excited, then no act of deglutition ensues. This is seen in dogs, not in rabbits.
4. When the pharyngeal branch of the glosso-pharyngeal is separately excited, then the inhibition takes place in the throat and chest part of the œsophagus. This result is obtained by experiments on dogs.
5. When the glosso-pharyngeal nerve is divided, then the œsophagus falls into a tonic cramp which can last more than a day. It is not difficult in rabbits to show the inhibitory action of the

glosso-pharyngeus upon the taking place of the act of deglutition. When the superior laryngeal nerves are irritated electrically a swallowing movement is called out, and about one second after this, the elevation of the larynx ensues, and on the bared cervical part of the œsophagus a contraction takes place. If now, immediately after the elevation of the larynx, which indicates the first part of the act, the glosso-pharyngei are tetanized for a short period, the contraction of the œsophagus does not take place.

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b.—GENERAL PATHOLOGY OF THE NERVOUS SYSTEM.

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ON PROCESSES OF DEGENERATION AND REGENERATION IN THE NORMAL PERIPHERAL NERVOUS SYSTEM. By Sigmund Mayer, *Prag. Vierteljahrsch.*, 1881.—The essential result of the author's investigations is, that in the peripheral nervous system of vertebrates there is a continual disappearance of medullated nerve fibres in variable number, while later a certain number recover their formerly normal condition. From this it appears that the medullated nerve fibres are not stable structures, but succumb one by one during the course of the various life processes which effect changes in their histological or chemical structure; so that the phenomena which the author is inclined to consider normal and subservient to the purposes of the organism indicate that they possess not so much of a perennial as a cyclical duration of life.

The author considers the full-grown rat (*mus. decumans*) as the best animal for examination, as this process of degeneration and regeneration seems to be quantitatively more decided in the rat than in other animals. The preparations were either examined fresh in a  $\frac{1}{2}$ -per-cent. solution of sodium chloride, or treated with a solution of hyperosmic acid (1:1000) for some time before teasing. The processes of degeneration commence by a subdivision of the medullary substance, while at the same time it has a more decided glistening appearance, and stains blacker with hyperosmic acid. The nuclei of the sheath of Schwann are usually enlarged at this stage; the fat-like subdivisions of the medullary substance increase more and more, although in portions the process disappears, the fat-like derivations of the myelin being no longer present, the contents consisting of a fine granular mass